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MONTHLY REPORT

Contract

25X1

PAR 217

22 Jan 65

SUBJECT: Optimization of Lasers

TASK/PROBLEM

1. Explore the production of 0.53 micron (blue-green) laser radiation by harmonic doubling in KDP and ADP crystals.

DISCUSSION

2. During the period covered by this report, the contractor's project monitoring group prepared the attached "Restatement of Goals" for this project. Laboratory work on this project was stopped at the end of the thirteenth period, by the departmental supervision of the group to whom this project is assigned, to await the restatement of project goals.

3. The contractor's "Technical Information Service" group supplied a number of technical journal articles on visible light lasers near the end of the period. These are being studied for useful information contributing to the possible comparison of the harmonic doubling technique with other methods of producing visible, coherent light.

PLANNED ACTIVITY

4. In the next period, we will:

a. Continue the search for reasons and possible corrective means for the nonuniform beam structure of the laser-crystal system.

b. Continue the literature study with the goal of providing a theoretical comparison between the harmonic doubling technique with other methods of producing visible, coherent light.

See Attachment "Restatement of Goals", dated 29 Jan 65.

Declass Review by NIMA/DOD

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Attachment to

PAR 217

22 Jan 65

SUBJECT: Optimization of the Laser - Restatement of Project Goals

TASK/PROBLEM

1. Explore the production of 0.5 micron (blue-green) laser radiation by harmonic-doubling in KDP and ADP crystals.

DISCUSSION

2. The findings and conclusions on this project and on Project 216, together with developments of new visible light gas lasers in other laboratories make it desirable to restate the goals of this project.

3. The findings of Project 216 were summarized as:

a. "No experimental evidence or theoretical prediction was found that a photographic emulsion (acting as a detector) reacts any differently to coherent than to non-coherent radiation, provided they are of the same approximate wavelength and energy level. Photographic materials for the detection of laser-generated radiation may be chosen by the same criteria as for the detection of other radiation of the same wavelength and energy level."

b. No further effort toward providing data specifically on the use of the laser with photographic sensitized materials is planned.

4. An effective, high power source of green (0.5 micron) laser radiation has been achieved. The beam produced has a characteristic basket weave pattern (nonuniform brightness) which makes it unsatisfactory as an exposing source in many potential photographic applications. An effort will be made to learn the causes of the nonuniformity and to discover means to make the beam uniform in brightness.

5. There is information being published on development of new visible-light lasers which may provide more convenient apparatus than the harmonic doubling system. A search of literature and vendors since June 1963 is being made and theoretical comparisons of the performance of these gas lasers with the harmonic doubling system will be attempted.

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6. Technical reports on the "theta-pinch" source for laser activation since the time of the preparation of the Project Authorization Request indicate that it is an inefficient technique. A minor effort on this project indicated that the equipment available in our laboratory is not adequate for high-repetitive-rate operation of the theta-pinch source and several thousand dollars worth of additional equipment would be required to make it adequate. In view of the discouraging reports in the literature, we propose to abandon tests on this manner of operation.

SUMMARY

7. Restatement of goals:

a. Attempt to learn the causes of the nonuniformity in the beam and to discover means to make the beam from the harmonic-doubling laser source uniform in brightness.

b. Conduct a literature and vendor search from June 1963 to the present on visible light lasers and attempt to make a theoretical comparison of their performance with that achieved by the harmonic-doubling system.

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